# The relation of the flora to the geological formations in Lincoln county, Kentucky.

HARRY A. EVANS.

All farmers recognize the relation existing between the timber and the soil (which must result in most cases from the underlying rock), as is evident from the expressions which they use in speaking of the quality of land, such as "walnut land," "white oak land," "beech land" and "ash land," as Henry Clay called his place from the abundance of ash trees which grew upon it. This relation is constantly forced on the collector's notice, and especially is this the case where the territory collected over has a number of formations represented. In this (Lincoln) county there are some twenty formations, all but two of which are of such surface extent as to give rise to characteristic soils.

Last summer I made as complete a list as was possible of the flowering plants occuring on each of these formations, taking care to include no plant which seemed to owe its position to the elevation or moisture of any formation, rather than to the character of the soil. Similar formations in the surrounding counties were examined, and the list corrected by dropping the names of any plants which were not common to each horizon in all of its exposures. (In the case of the Chazy, Birdseye and Upper Subcarboniferous this was not done.)

From this list, thus corrected, I have tried to determine the species which prefer, or are peculiar to, each of the formations in this county. Whether the results, as given in this article, will hold good for other localities I do not know; if they do not it will show that the position of the plants here is due to some condition of exposure, elevation or moisture, and not to the character of the soil. I hope that collectors in states where the formations here given occur will test the results.

Most of the plants which are mentioned on only one formation I have never found on any other; with one exception no plant is mentioned if only a small number of specimens of it have been observed.

CHAZY.—The Chazy limestones, 225 feet in thickness, are seen in this state only on the Kentucky and Dix rivers, near the mouth of the latter. They form the base of the high

cliffs through which these streams flow at that point, and are the oldest rocks brought to view in the state. They give rise to no soil; the plants mentioned as occurring on them are found growing in crevices in the cliffs.

Silene rotundifolia Nutt.
Polygala Senega L.
Cladrastis tinctoria Raf.
Ribes Cynosbati L.
Galium trifidum L.
G. circæzans Michx.
Nemophila microcalyx Fisch. and Meyer.
Enslenia albida Nutt.
Ulmus racemosa Thomas.
Tradescantia pilosa Lehm.

BIRDSEYE.—The Birdseye is found just above the Chazy, and like it is seen only at and near the mouth of Dix river. It forms no soil; the plants mentioned are found in fissures in the rock.

Arenaria patula Michx.
Polygala Senega L.
Galium trifidum L.
Juniperus Virginiana L. Covering the cliff wherever it can get a foothold.

TRENTON.—There are four phases or divisions of the Trenton in this section: (1) at the base a siliceous clay; (2) beds of gray and dark blue limestones—the Blue Grass Beds; (3) a granular limestone, frequently nearly a sandstone; and (4) dove-colored limestones, much like the Birdseye. All of the series form excellent soils, the Blue Grass limestones giving the best in the state—the famed Blue Grass soils.

(Siliceous limestone.)

Liriodendron Tulipifera L.
Silene noctiflora L.
Hydrangea arborescens L.
Quercus alba L.
Fagus ferruginea Ait.
Stylophorum diphyllum Nutt.
Tilia Americana L.
Acer saccharinum Wang.
Gymnocladus Canadensis Lam.
Prunus serotina Ehrhart.
Geum macrophyllum Willd.
Fraxinus quadrangulata Michx.
Ulmus Americana L.
Celtis occidentalis L.
Morus rubra L
Carya sulcata Nutt.
Polygonum biflorum Ell.
Quercus Prinus L.

(Granular Limestone.—Entirely barren at the only place I have seen it in this county.)

(Upper Birdseye.)

Juniperus Virginiana L.

LOWER HUDSON RIVER.—These beds are made up of alternate layers of limestones and shales; where exposed the

latter decompose very rapidly, giving rise to an excellent soil.

Euonymus atropurpureus Jacq.
Quercus alba L.
Q. obtusiloba Michx.
Q. imbricaria Michx.
Trillium grandiflorum Salisb.

MIDDLE HUDSON RIVER.—Composed of sandy shales and sandstones, which give rise to a soil that remains moist in the driest weather.

Liriodendron Tulipifera L.
Oxalis violacea L.
Cuphea viscosissima Jacq.
Asclepias incarnata L.
Polygonum Virginianum L.
P. dumetorum L.
Euphorbia humistrata Engelm.
E. commutata Engelm.
Fagus ferruginea Ait.
Trillium grandiflorum Salisb.

UPPER HUDSON RIVER.—These beds fall naturally into three divisions; at the base (1) a limestone (full of fossils) in thin layers, between which are layers of clay shales; this division decomposes rapidly, forming an excellent soil; (2) sandy limestones, in beds of considerable thickness; and (3) a limestone containing much earthy matter and silica.

(1. Lower Division.)

Anemone Caroliniana Walt.
Ranunculus muricatus L.
Aquilegia Canadensis L.
Dicentra cucullaria DC.
D. Canadensis DC.
Corydalis flavula Raf.
Dentaria multifida Muhl.
Silene Virginica L.
Lychnis Githago L.
Prunus serotina Ehrhart.
Eupatorium ageratoides L.
Aster oblongifolius Nutt.
Collinsia verna Nutt.
Fraxinus quadrangulata Michx.
Celtis occidentalis L.
Juglans cinerea L.
Quercus alba L.
Q. Prinus L. var. acuminata Michx.
Trillium sessile L.

(2. Middle Division.)

Impatiens pallida Nutt.
I. fulva Nutt.
Trifolium procumbens L.
Œnothera biennis L.
Galium Aparine L.
Asclepias Cornuti Decaisne.

(3. Upper Division.)

Galium triflorum Michx.
Eupatorium serotinum Michx.
Scrophularia nodosa L.
Asclepias tuberosa L.
Pilea pumila Gray.
Pardanthus Chinensis Ker.

MEDINA.—Soft, easily pulverized, giving a sandy soil which erodes badly, and which once denuded of vegetation rarely becomes covered again.

Sassafras officinale Nees.
Quercus alba L.
Q. obtusiloba Michx.
Q. falcata Michx.

CRAB ORCHARD SHALES.—Mud shales, containing a few thin layers of limestone.

Acer rubrum L.
Negundo aceroides Moench.
Gleditschia triacanthos L.
Liquidambar Styraciflua L.
Ulmus Americana L.
Platanus occidentalis L.
Juglans nigra L.
Carya alba Nutt.
Quercus alba L.
Q. obtusiloba Michx.
Q. macrocarpa Michx.
Q. Prinus L. var. acuminata Michx.
Q. rubra L.

CORNIFEROUS.—Layers of limestone, often containing masses of silica, forming a red soil.

Hypericum perforatum L.
Acer saccharinum Wang.
Cassia Marilandica L.
C. Chamæcrista L.
Potentilla paradoxa Nutt.
Vernonia Noveboracensis Willd.
Lobelia leptostachys A. DC.
L. spicata, Lam.
Acalypha Virginica L.

BLACK SLATE.—Thin layers of slate which are somewhat bituminous. When well-drained this slate decomposes into a soil which is fair, especially where there is a leaf-mold. In places where the layers of slate are horizontal the drainage is poor, giving rise to a very wet soil.

(Level and badly drained portion.)

Polygala Curtissii Gray.
Rhexia Virginica L.
Quercus alba L.
Q. obtusiloba Michx.
Q. imbricaria Michx.
Q. rubra L.
Commelyna Cayennensis Richard.

(Well-drained portion.)

Liriodendron Tulipifera L.
Rhus glabra L.
Desmodium Dillenii Darlingt.
Lespedeza repens Torr. & Gray.
Liquidambar Styraciflua L.
Vernonia Noveboracensis Willd.
Gerardia integrifolia Gray.

LOWER SUBCARBONIFEROUS.—This formation has at its base (1) a considerable thickness of ash colored shales; (2) above these harder shales with some limestones; (3) just above the upper subcarboniferous, hard shales and sandstones.

(Lower Division.)

Ascyrum Crux-Andreæ L.
Stylosanthes elatior Swartz.
Eupatorium purpureum L.
Aster longifolius Lam.
Polymnia Uvedalia L.

(Middle and Upper Divisions.)

Eupatorium sessilifolium L.
E. perfoliatum L.
Oxydendrum arboreum DC.
Kalmia latifolia L.
Euphorbia corollata L.
Castanea vesca L.
Pinus mitis Michx.

UPPER SUBCARBONIFEROUS.—Heavy beds of limestones, found only on the highest knobs.

Hypericum nudicaule Walt.
Quercus nigra L.
Q. coccinea Wang.
Juniperus Virginiana L.

The Birdseye and Upper Birdseye, both pure limestones, are covered by cedars, to the exclusion of nearly everything else. On the Upper Subcarboniferous limestones cedar is present in large numbers, but does not attain such size as on the other formations; at every point at which I examined the Upper Subcarboniferous, if not covered with cedar, *Hypericum nudicaule* Walter is found in the greatest abundance.

The Oaks are represented by some species on most of the formations. *Quercus alba* L. is found in numbers on the Lower and Upper Hudson River Beds, and on the Medina sandstone, but seems to prefer the siliceous limestones at the base of the Trenton. *Q. obtusiloba* Michx. is found on all formations which give rise to a light or sandy soil. Excepting a few small trees on the Black Slate, *Q. imbricaria* Michx. is found only on the Lower Hudson River. So far as can be determined from observations in this county, *Q. nigra* L. and *Q. coccinea* Wang. are characteristic of the Upper Subcarboniferous.

*Fagus ferruginea* Ait. prefers a siliceous soil; and in Lincoln is most abundant on the siliceous limestones of the Trenton, but in the surrounding counties the beech forests are on the Middle Hudson River Beds—the "siliceous mudstones" of the old Kentucky reports.

*Stanford, Ky.*

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## EDITORIAL.

THE GAZETTE is naturally deeply interested in the success of the Agricultural Experiment Stations, because the establishing act makes such extensive provision for botanical investigation. It is because of our great interest in their work that we have ventured to express our opinion as to its direction and scope, and particularly as to the mode of presentation. It seems that some of the experiment stations think our advice